

NEW SOCIAL BEES.

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A close study of the Neotropical social bees of the genera *Melipona* and *Trigona* brings out the fact that there are numerous local races or subspecies, such as may be found among the ants. Most of the new forms coming to light are so closely related to others previously described, that it becomes a matter of convenience or opinion whether to regard them as distinct but closely related species, or races of aggregate species. Two or more of these closely related forms may occupy the same general region, and on the other hand, any one of them may extend over an enormous territory. They do not seem to be closely related to any special environmental factors, but they do follow the lines of general variation in the group, showing greater or less intensity of color or extension of color-pattern. They are practically constant in any one lot, and we do not find much miscellaneous individual variation. All this so closely parallels the condition among the ants, that we naturally look for a common cause or factor, which can only be the social mode of life, with continual inbreeding. In both groups, it is probably rare for individuals to mate with others than members of their own colony. Following up this idea, we note a similarity between the relationship of the different forms and that to be observed between these occupying a series of small islands; *e. g.*, the birds of the Lesser Antilles, or the rats of the small islands of the Malay Archipelago. Continual inbreeding within a limited group or area will lead to homozygosity, and small differences in the original constituents may appreciably affect the end result. An occasional cross between stable races thus established will break up the combinations and furnish material for a series of new types.

It must be said, however, that in *Bombus* we do not observe the same state of affairs. The species of *Bombus* are notoriously variable in color, and the varieties are largely local, but they are also largely individual. In *Bombus*, if I rightly understand the facts, the odoriferous males assemble from various nests, and do not necessarily or perhaps more than frequently mate with members of their own colony. If this is true, we can see why there is

more miscellaneous variation in *Bombus*, and less tendency to produce a series of slightly different yet constant races.

Although we cannot discern any obvious connection, at least of an adaptive nature, between the color-variations of all these genera and the environment, it does not follow that no relation of any sort exists. In *Bombus*, at least, there are some very remarkable cases of parallel variation in particular regions. This subject has been dealt with at length by Friese and Wagner, and O. Vogt, and Sladen gives a summary of some of the more important facts in his work "The Humble-Bee," p. 148. A most striking case is described below; the beautiful black, white and red colors of *Bombus terrestris simlaënsis* are duplicated by those of *B. niveatus callophenax* from the same region, though structurally the bees are quite distinct. It is beyond belief that all these cases of parallel color variation are accidental, depending on no common cause. There may be Müllerian mimicry involved, but the whole subject appears to need further investigation. It is not impossible that in some cases the coloration really indicates relationship, and that the structural characters have varied. We always tend to assume that structure is far more permanent than color or marking, but fossil insects show the enormous antiquity of color-patterns. In the quite numerous cases in which bees resemble in color and pattern species of quite other genera, or even wasps, it is manifest that the colorational similarity is secondary, and not due to common descent from insects so colored.

Bombus terrestris simlaënsis Friese

Female: Kashmir, 9,000 ft., June 1911 (*R. L. Woglum*). This has the relatively short malar space of *B. terrestris*, as also has a worker of *B. terrestris fulvoinctus* Friese, from Simla, which was labelled *B. tunicatus* Smith in F. Smith's collection. Meade-Waldo has recently referred *B. tunicatus* Smith as a variety to *B. lapidarius*; but the specimen before me, from Smith's collection, has rather the structure of *terrestris*. The type locality of *tunicatus* is Chusan, China. According to Meade-Waldo, *B. gilgitensis* Cockerell is also a variety of *B. lapidarius*, but the form of the malar space seems to ally it rather with *B. terrestris*. *Bombus incertus* Morawitz, which I have from A. Skorikov, is said by Meade-Waldo to be the same as *tunicatus*; it has the structure of *lapidarius*, not

that of *terrestris*. The indications are that Smith mixed two species under *tunicatus*, which explains the discrepancy referred to above.

***Bombus niveatus callophenax* subsp. nov.**

Female: Length about 19 mm.; exactly like *B. terrestris simlaënsis* in color and appearance, except that it is considerably less robust, but easily separated by the third antennal joint, which is about three times as long as fourth, longer than fourth and fifth, but not quite equal to 4-6; also by the much longer malar space, which is fully 1.5 times its apical width. From typical *B. niveatus* (which I have from A. Skorikov) it is known by the white and black hair on the second abdominal segment being arranged as in *simlaënsis*, the lower edge of the white strongly curved, not reaching hind margin of segment. The surface of the clypeus is more polished and less punctured than in *niveatus*. It differs from *B. gilgitensis* at once in the malar space, the distinctly though delicately punctate apical segment of abdomen, the white hair of scutellum not mixed with black, and venter of abdomen without fulvoferruginous hair. The apical abdominal segment has scanty black hair (it is red in *niveatus*), and the wings are dark reddish, much darker than in *niveatus*. From *B. incertus* it is easily known by the antennæ. Kashmir (*R. L. Woglum*). U. S. Nat. Museum. Perhaps a distinct species, to be called *Bombus callophenax*.

***Trigona mirandula* sp. nov.**

Worker: Length about 5 mm., rather robust, shining; head large, broader than thorax, but facial quadrangle considerably longer than broad; mandibles without teeth, basal half yellow, apical red; labrum yellowish; cheeks pale yellow suffused with red; malar space obsolete; clypeus ferruginous, the lower margin pale yellow; supraclypeal area and lower half of middle of front pale reddish, but sides of face almost to summit of eyes with extremely broad pale yellow bands; upper half of front black, with a median yellow line; vertex black; scape light ferruginous, darkened at apex; flagellum dark above, reddish beneath; mesothorax black, with narrow lateral margins, which extend to axillæ; rest of thorax clear red; legs red, hind tibiæ longitudinally divided red and black, the black extending right across apically; hind basitarsi largely dark; hind tibiæ broad, but not extremely so, the fringing hairs pale red;

hind basitarsi ordinary; tegulæ pale reddish; wings grey, stigma and nervures dusky reddish, not dark; abdomen red, each segment with a rather broad black band, the whole coloration rather dark and obscure, but shining.

Pozo Azul, Costa Rica, June 15, 1902 (*M. A. Carriker*). U. S. Nat. Museum. A remarkably ornamented species, related to *T. zonata* Smith, but differing in color of legs and several other details.

***Trigona beccarii jombenensis* subsp. nov.**

Worker: Like *T. beccarii* Gribodo, except that there is more light color on scape, and the clypeus is yellow, with a narrow black band along anterior margin, and a pair of oblique reddish marks above.

Jombene Range, East Africa (*Chanler-Hohnel Expedition*). U. S. Nat. Museum.

***Trigona curriei* sp. nov.**

Worker: Length about 3 mm., robust, black; head large and quadrate; mandibles and base of scape red; clypeus with a median groove; whole body polished and shining; cheeks very broad; tegulæ fuscous; wings dilute brownish, stigma pale with a dusky margin; legs obscurely reddish; abdomen short and broad, the first segment very obscurely more or less reddish. Related to *T. magretti* Friese, but easily separated by the brownish wings. The head also is quite broad.

Mt. Coffee, Liberia, Africa, April, 1897 (*R. P. Currie*). U. S. Nat. Museum.

***Trigona musarum* sp. nov.**

Worker: Length about 6 mm., robust, clear reddish-fulvous, with little hair; head large, but facial quadrangle longer than broad; clypeus and sides of face suffusedly yellowish; mandibles dusky at apex, of the simple type, with a small tooth at inner corner; malar space well developed; face and front shining; vertex with fuscous hair; scape long and slender, yellow, with a dark mark posteriorly above; flagellum piceous above, ferruginous beneath; thorax above polished and shining, with thin brown hair; mesothorax rather obscurely spotted with fuscous, the lateral margins and axillæ obscurely yellow; tegulæ large, light fulvous; wings dilute grey, stigma slender; legs entirely fulvous, anterior and mid-

dle ones with concolorous hair; hind tibiae extremely broad, hind margin with dark hairs; hind basitarsi broad, the outer apical angle produced as a broadly rounded lobe; abdomen broad, shining, the apical part suffusedly dusky.

Type: From "Philadelphia Banana R.," Costa Rica (*F. Knab*). U. S. Nat. Museum. Also from Boqueron River, Panama, May, 1907 (*Aug. Busck*). The name given is from *Musa*, the banana. Differs from *T. mellea* Smith and *T. pallida* Latr. by the broad hind tibia and quite differently shaped basitarsus. From *T. mellicolor* Packard (which M. A. Carriker has taken at Pozo Azul, Costa Rica), it differs at once by the shape of the head. *T. mellicolor* is a member of "coccofago" group, and has an extremely broad head; while the metathorax is black, with a transverse testaceous patch.

Trigona salvatoris sp. nov. (*tataira* subsp.?)

Worker: Length 5-5½ mm.; closely allied to *T. mediorufa* (Cockerell), with the same black and red pattern of mesothorax, but differing thus: head black (faintly reddish), the clypeus dull yellow with two dark marks, a pale spot behind lower end of eye (in immature specimens the whole head dusky reddish); scape dark reddish; posterior half of abdomen suffusedly dusky.

Type: From S. Salvador, Salvador, August 15 (*F. Knab*). U. S. Nat. Museum. Also from Escuintla, Guatemala (*F. Knab*). Perhaps only a race of *T. mediorufa*.

These bees of the "coccofago" group, with their very broad heads and remarkable habits, may be regarded as a distinct subgenus (*Oxytrigona* subg. n.), with *mediorufa* as the type. *T. mediorufa* was described as a subspecies of *T. flaveola* Friese, but the latter name cannot stand, as there is an earlier *T. flaveola* Spinola. It is assumed that *T. coccofago* or *cagafogo* (the name is variously spelled) is identical with *T. tataira* Smith; in fact "tataira" is the popular name of the bee. When making comparisons in PSYCHE, 1913, p. 13, I neglected to note that my cotype *tataira* was a male, and that the name was founded by Smith on males alone. It seems probable that we shall have to recognize a species *T. tataira*, with various races, as follows:

Trigona tataira Smith.

Trigona tataira friesiella n. n. (*flaveola* Friese).

Trigona tataira mediorufa (Ckll.).

Trigona tataira salvatoris (Ckll.).

T. mellicolor Pack. should apparently be kept distinct. The question whether to regard all these bees as species, or group them as races of an aggregate species, must be decided largely on grounds of convenience. The case is parallel to those frequently observed among ants.

Trigona perangulata sp. nov. (*clavipes* subsp.?)

Worker: Length about 7 mm., slender; very close to *T. clavipes* Fabr., differing thus: lateral face-marks coming up to level of top of clypeus; legs clear red, with trochanters yellow on outer side, anterior and middle femora yellowish above apically, middle basitarsi with most of posterior half black, hind tibiae broadly black posteriorly on apical half (this black area anteriorly with a large round lobe), hind basitarsi largely blackened; abdomen with four black bands, the first divided in middle by a cuneate paler area, the others angularly pointed in middle cephalad, and correspondingly notched caudad.

Type: From Alhajuelo, Panama (Canal Zone), May 27, 1912 (*A. Busck*). U. S. Nat. Museum. Also from Pozo Azul, Costa Rica, June 15, 1902 (*M. A. Carriker*).

Trigona pachysoma sp. nov. (*postica* subsp.?)

Worker: Length about 6 mm., very broad and robust, with short abdomen. Very close to *T. postica* Lat. (Prov. Sara, Dep. Sta. Cruz de la Sierra, Bolivia, 500 m., *J. Steinbach*), but with an obscure red spot on each side of face, wings strongly suffused with orange, nervures and stigma clear ferruginous, fifth abdominal segment without evident pale hair-patches. Compared with *T. bipunctata* Lep. (from F. Smith's collection) it is more robust, with more highly colored wings; the facial spots in *bipunctata* are dull white.

Type: From Porto Bello, Panama, April 20, 1912 (*A. Busck*). Also from Culebra, Canal Zone, 1910 (*H. H. Rousseau*). These insects have strong grooves on the mesothorax, which are lacking in the superficially similar *T. branneri* Ckll. In *T. branneri* the abdomen is dorsally polished and shining all over; in *T. pachysoma* dull, the bases of the segments shining. My *T. postica* is from the

Berlin Museum, and was determined by Strand. Specimens from S. Paulo, determined as *postica* by Friese, are another species, having the tubercles tipped with yellow, and the abdomen beyond second segment covered with fulvous hair.

Trigona nitidula sp. nov. (*frontalis* subsp.?)

Male: Length about 4 mm.; closely resembling *T. frontalis* Friese, but the wings are quite clear (not greyish), and the nervures and stigma are dull testaceous; the abdomen is entirely dark. Eyes red; orbits converging below; clypeus, labrum, supraclypeal area and lateral face-marks yellow; mandibles yellow; scape yellow in front. Thorax shining black, with narrow lateral margins of mesothorax, axillæ and hind margin of scutellum cream-color.

Tucuman, Argentine, December 26, 1912 (*A. H. Rosenfeld and T. C. Barber*). U. S. Nat. Museum. The types of *T. frontalis* came from Honduras, whence are also specimens in the U. S. National Museum, received from Friese. A related but larger species is *T. remota* Holmbg., which I have from S. Paulo, Brazil. Also of this group is *T. molesta* Puls, of which I have seen specimens from S. Paulo and Blumenau, determined by Friese.

Trigona opaca sp. nov. (*lineata* subsp.?)

Male: Length about 5 mm.; black, the front, long mesothorax and large scutellum dull; band on prothorax (interrupted in middle), lateral margins of mesothorax, continuing on axillæ and round margin of scutellum, as well as a large mark on tubercles, from which a line proceeds anteriorly, all clear yellow; clypeus (except two light brownish bars on disc), mandibles, supraclypeal mark (separated by a line from clypeus) and narrow bands along inner orbits to not far from top, all pale yellow; labrum dark brown, with a pale dot at each side; malar space small; eyes red; scape yellow in front; flagellum black, obscure red beneath; anterior and middle tibiæ light yellow on outer side, hind tibiæ with a broad light yellow band behind; tarsi rufofuscous; tegulæ rufofuscous, with a minute pale dot; wings greyish, with a pale yellow spot at base, just behind tegulæ, stigma and stronger nervures piceous; abdomen dullish, without markings, whole insect almost hairless, looking like a *Prosopis*.

Tabernilla, Canal Zone, Panama, July, 1907 (*A. Busck*). Very

near to *T. lineata* Lep., but with yellow markings, and apparently distinct. Unfortunately, I do not know the male of *lineata*; and even R. du Buysson, who had a nest full of *lineata*, found no males. There is a good deal of confusion as to what *T. lineata* really is. The species I accept as such (from Brazil) is that called *lineata* by Friese. Baker and Ashmead formerly identified as *lineata* Mexican specimens of *T. frontalis flavocincta* Ckll., an insect easily separated by the shining mesothorax. Ducke stated in 1910 that *T. bilineata* Say was the same as *lineata*; but what I have regarded as *bilineata* (e. g. from Mexico, D. F., *J. R. Inda*) is extremely close to *T. bipunctata* Lep., agreeing in the light patches at sides of face. The clypeus of *bilineata*, as thus interpreted, is highly polished; that of *bipunctata* dullish.

Trigona atomaria sp. nov.

Worker: Length about 3 mm.; yellow, including antennæ; face and front without markings, but vertex with a transverse dark band enclosing ocelli; metathorax dorsally pure black; legs yellow, hind tibiæ (which are not unusually broad) with hind and apical margins on outer side broadly brown, hind basitarsi, brown on outer side; tegulæ pale testaceous; wings clear hyaline, nervures and stigma pallid; stigma large, with a dusky margin; abdomen with black bands on hind margins of segments. Head ordinary, abdomen broad.

Pozo Azul, Costa Rica, June 15, 1902 (*M. A. Carriker*). A singular little species, not close to any other. It may perhaps be compared with *T. goeldiana* Friese, from Pará, but the markings are wholly different.

Trigona ferricauda sp. nov.

Worker: Length about 5.5 mm., with long and ample wings; head large but of ordinary shape, black, with clypeus, supraclipeal area and lower corners of face (the last obscurely) ferruginous; sides of face and cheeks with a dense pale (olivaceous on cheeks) pruinose pubescence; front and vertex smooth and shining; mandibles ferruginous, strongly quadridentate, with also a minute tooth between third and fourth, the teeth black; malar space short; scape light rufotestaceous, black above at apex; flagellum black above, rufotestaceous beneath, last joint bright red above

and below; thorax rufofulvous, with pale hair; mesothorax shining, black with narrow red lateral and hind margins; mesopleura with a large black spot below; middle of mesothorax shining, distinctly darkened, sides densely ochreous-pruinose; tegulæ pale rufotestaceous; wings greyish; stigma slender, dull pale yellowish; legs entirely clear ferruginous, hind tibiæ relatively narrow, the fringe on hind margin long and red; hind basitarsi nearly parallel-sided; abdomen rather narrow, entirely shining ferruginous.

Porto Bello, Panama, April 18, 1912 (*A. Busck*). Related to *T. braueri* Friese, from Brazil, but readily separated by the black mesothorax. There is a strong superficial resemblance to *T. dorsalis* Smith, which occurs at Alhajuelo, Panama (*Busck*), Guapiles, Costa Rica (*Crawford*) and Secanquin, Guatemala (*G. P. Goll*).

SYNOPTIC KEYS TO THE LYGÆIDÆ (HEMIPTERA) OF THE UNITED STATES.

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PART I.

Several months ago I was requested by Dr. W. E. Britton of the Connecticut Agricultural Experiment Station to prepare a list of the Lygæidæ occurring in Connecticut, with suitable keys, for the proposed list of Hemiptera of the state. As a basis for this work I found it necessary to construct synoptic keys of all of the subfamilies, tribes and genera for the entire United States. As so much time and study has been spent in their preparation, and as no such keys covering this family, restricted to our fauna, has ever been published, it seems advisable to publish these in the hope that they may be of service in solving some of the difficulties experienced by systematists in this troublesome group. Professor Gregory, superintendent of the Connecticut Geological and Natural History Survey, and Dr. Britton have kindly given their consent to this publication in advance of the appearance of such parts as apply only to New England Lygæidæ.

I have used as a basis for these keys Stal's "Genera Lygæidarum